Handling Degraded Communications

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BATTLEFIELD DIGITIZATION is expected to greatly increase the amount, types and speed of information communicated. If these enhancements prove as valuable as anticipated, then any inability to communicate and pass data digitally will have significant ramifications. Whether analog or digital, electronic communications will be occasionally degraded, sometimes causing serious problems for operational units. However, degradation can often be avoided or minimized if soldiers act appropriately. Leaders must consider certain changes in training and battle staff processes to ensure their soldiers act appropriately on the digitized battlefield.

The Focused Dispatch Advanced Warfighting Experiment (AWE), the second AWE on battlefield digitization, used relatively unfamiliar field exercise locations. The terrain and other field conditions made degraded communications a strong possibility. In addition, realistic communications degradation was also introduced for the first time into a simulation as part of the Focused Dispatch AWE constructive-virtual-live spiral development process.[1] These situations and experiences made unit personnel aware of the reality and impact of degraded communications.

Observations and Analysis

Many commanders and battle staffs actively address communications during planning and interactively develop courses of action (COAs) to avoid, minimize or accommodate any problems. Other warfighters, however, are more inclined to assume adequate communications capabilities during COA development, analysis and comparison—unless clearly told otherwise.[2] Anecdotal evidence suggests that commanders and staffs who actively consider communications capabilities have learned the hard way through costly field experience with degraded communications.

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Three conditions cause many communications problems within operational units:

- Lack of training with realistic communications and lack of education in tactical communication concepts, such as avoiding degradation and not informing the opposing force (OPFOR).
- Insufficient interaction between signal and other battle staff personnel during mission planning, preparation and execution.
- Assumptions of communications infallibility.

These three conditions are closely interrelated: the first being the probable major cause of the second and third; the second and third being major causes of each other. More realistic training situations and better knowledge of tactical signal concepts (condition 1) with change to staff processes (condition 2) would probably eliminate condition 3. Adopting a more interactive model for staff processes will lead to better handling of communications degradation on real battlefields.

Digitization. Battlefield digitization is expected to increase the amount, types and speed of information communicated. Any degradation in signal transmission, reception or processing capabilities will be serious. To correct the three deficits, a more interactive and reality-based staff process will become a requirement rather than a choice. This paradigm would be composed of warfighters and signal soldiers interacting consistently and dynamically regarding communications-support decisions. A change in tactical decision-making processes would respond to a sea change that digitization causes.

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Communications doctrine. The doctrinal concept for conventional brigade communications is presented in US Army Field Manual (FM) 71-3, *The Armored and Mechanized Infantry Brigade*, which states that "the commander and staff must understand the capabilities, limitations and vulnerabilities of the brigade communications system."[3] FM 71-3 further directs that leaders plan for electromagnetic interference and know that terrain, atmospheric conditions and electromagnetic pulse from nuclear blasts hinder transmissions. Similar manuals provide the groundwork for conventional electronic communications responsibilities in battalion task forces and company teams.[4]

The commander's responsibilities include providing redundant and backup means for communication, preserving and protecting those means, denying information and opportunities to the OPFOR and ensuring subordinates know what to do during interrupted communications. Command and control warfare (C^2W) is a way to protect command, control, communications and intelligence (C^3I).[5]

Developing tactics, techniques and procedures (TTP) for digital units is an ongoing process. An early example, Fort Knox Special Manual 71-2-2, *Tactics and Techniques for the Digitized Battalion Task Force*, documents TTP for a battalion task force equipped with M1A2 tanks and their Inter-Vehicular Information Systems (IVIS).[6] Currently under revision, FM 71-3 is expected to retain its overall concept of concerns and responsibilities, but it will also reflect digitization's impact. Included may be descriptions of the information systems that will be a part of digitally equipped brigades. The doctrine will likely more explicitly recognize the potential for disrupted communications and identify prevention measures while considering a more proactive C^2W stance.

Degraded communications. Degraded communications characteristics include missing, delayed or erroneous data; no data received at all; and voice messages that are difficult or impossible to hear or decipher. These characteristics affect both digitally equipped units and nonmodernized, or analog, units. The battlefield never guarantees successful transmission and reception of electronic communications—or their completeness and validity. Electronic communications have never been perfect under all conditions, even if the software performs as designed, the equipment is totally reliable and equipment-operating procedures are performed correctly.

Other factors can also degrade communications, including terrain features, distance, meteorological conditions, electronic interference and the enemy. These factors can degrade digitized and conventional capabilities, although not necessarily to the same extent or in the same manner. Degradation can affect line-of-sight (LOS) systems, such as the

Specter of the E-Bomb

A rocket is launched into a crowded metropolitan area, but instead of a conventional explosive payload, it deploys an array of aerials that spring out and release a burst of radio frequency, knocking out all electronic devices in the target area. The burst lasts less than a second and cripples the civil structure to include telephone, television, radio and electrical networks. It also renders military command and control systems, weapon computers, radios and radar systems completely useless. The weapon does all this without directly causing a single human casualty.

According to the *London Daily Telegraph*, the nonuclear, nonlethal artillery shell is being developed in England to incapacitate an enemy's electronic equipment. The impetus to develop this technology came from a 1994 paper presented at a Bordeaux conference by A. B. Prishchipenko entitled "Radio Frequency Weapons on the Future Battlefield." Four years later the Russians had developed a portable electromagnetic device, or E-Bomb, capable of disabling electrical and electronic systems. Research on this technology dates back to the late 1940s and seemingly enables a high-tech force's worst nightmare.

The Novel Technology Section of Britain's Matra BAe Dynamics responded by working on a means to counter the Russian weapon as well as producing a version in the West. A successful test would demonstrate that the technology can paralyze an adversary's electronic command and control, weapons and resupply systems without lethal force. The weapon's developers have persuaded the British Ministry of Defense (MOD) that the weapon is feasible. The MOD has taken the first step in the procurement process by publishing a summary of requirements for "Radio Frequency Munitions delivered by 155mm shell or rocket." Such a weapon is low-cost, easy to deploy without warning and difficult to counter.

single-channel, ground-air radio system (SINCGARS), which are still the principal means for conveying electronic messages. Alternatives, such as satellite communication, can transcend terrain features and distance but also can be problematic.

Imperfect communications are a fact of life. But changes in communications quality are never capricious; some effects are just more predictable (terrain features) than others (the enemy). Battlefield dynamics only exacerbate those effects, so it is important to anticipate communications degradation as specifically as possible and avoid or minimize its impact by choosing alternative or modified COAs. The key is knowing what will likely degrade communications where and when.

A New Paradigm

There have always been problems.[7] Until recently, a simple model of communications as a part of staff operations has seemed adequate: require a signal annex to the operation order (OPORD), and unless told otherwise, assume the communications capabilities will be adequate. If communications fail during operations, request signal action. This view of communications degradation worked earlier in the simpler electronic worlds and slower battlefields when signal soldiers could more easily work around communications problems and often make them appear transparent.

Signal and nonsignal soldiers were on separate tracks with little interaction during planning and preparation phases. Commanders and involved staff members would develop, analyze and compare COAs on terrain trafficability and concealment opportunities; intelligence regarding probable enemy movement; and effective weapon placement—but not on the possibility of signal degradation. Signal officers were not involved until preparing an OPORD's signal annex. At that point, signal soldiers were inclined to deal with problems without discussion, the inclination not to speak being especially pronounced among relatively junior officers.[8] However, the tendency not to interact probably stemmed more from the training deficiencies noted than from differences in age or rank.

In the past, brigade and battalion staff members' training largely reflected the noninter-active, functionally deficient paradigm.[9] The US Army Research Institute is now conducting three re-search and development programs to address these deficiencies: the Battle Staff Training System (BSTS), the Staff Group Trainer (SGT) and Brigade and Battalion Staff Exercises (BBSE).[10]

US Army

A soldier from the 7th Signal Brigade uses an AN-TSC 93B Tactical Satellite Terminal for communications with forward units. The terminal at Split, Croatia, supports Operation *Joint Endeavor*.

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BSTS will serve individual needs for functional area instruction and provide concepts on contributing to collective staff efforts. The SGT will provide intermediate-level training to transition soldiers from individual position knowledge to participation in full-staff exercises. The training support packages for BBSE meet more advanced staff training needs and can be tailored for various training-audience configurations.

Another training problem is the lack of realistic degraded communications in current live, virtual or constructive training simulations. Until now, virtual and constructive simulations have provided perfect communications when, in reality, intervening terrain features and distance present problems. The new Close Combat Tactical Trainer and the constructive Warfighter Simulation 2000 are designed to provide at least some realistic electronic communications degradation features.[11]

Live-training simulations are not entirely realistic either. Repeated use of already-constrained training areas and the high priorities of other training objectives often lead to terrain and scenario combinations having few communications problems.

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What problems do occur often appear random or equipment-driven, although they might not be, and are often treated as unavoidable events. Few cues presented during any current staff or combatant training stimulate interaction between signal and nonsignal soldiers.

Finally, there is no requisite education or training for warfighters on tactically using electronic communications. The conceptual focus of warfighter education and training is quite properly on fighting the battle, but on the digitized battlefield, the tactical aspects of communications degradation and unintentionally informing the enemy are critical to the fight. The goal is not technical signal expertise for warfighters but conceptual signal tactics for commanders and staffs.

For now, the requisite part of signal education and training for warfighters focuses mainly on equipment. When a second lieutenant graduates from the Armor Officer Basic Course, he will have received 16 hours of classroom instruction on SINCGARS equipment, capabilities and operation. He will also have experienced a 72-hour field exercise during which radio systems were used. Subsequent explicit instruction on maintaining communications capability and avoiding degradation will vary considerably. Except for a few instances, this instruction is neither complete nor systematic. Usually communications issues are emphasized only in units that experience difficult terrain, boundary limitations and hostilities.

Planning, Preparation and Execution

More appropriate for electronic communications considerations on the digitized battlefield is a paradigm in which communications capabilities and security are integral to mission planning, preparation and execution. Operating from their own positions of responsibility, warfighters also deal with communications degradation by working interactively with signal soldiers during staff operations. During planning, interaction is a two-way flow of information. This interaction could result in different and better COAs by changing to an alternative maneuver scheme that has the same advantages but less risk of communications degradation. Other results of increased interaction might be adding information operations to the synchronization matrix and spelling out communications risk-management procedures for more participants.[12]

Observations from the Focused Dispatch AWE

The principal unit in the Focused Dispatch AWE was a mounted maneuver battalion/task force equipped with legacy (existing) digital systems. Executed missions emphasized the battlefield operating systems of fires, intelligence, combat service support and battle command. Many of these systems were designed to meet older requirements for restricted, or "stove-piped," users. For example, legacy digital systems were purposely designed not to exchange information on many parameters across echelons and types of units.

Communications degradation was an unavoidable reality. Focused Dispatch AWE missions and portions of the training took place in areas unfamiliar to the unit. The areas included rough terrain and mineral deposits, making exercises electronically challenging. Equipment limitations included voice and data contention, insufficient channel capacity and legacy equipment items that could not cross-communicate. When feasible, workarounds were developed.[13]

When the Focused Dispatch AWE commander and staff war-gamed alternative troop movement patterns and considered command post and operations center placement, they often addressed communications capability and purposely involved the signal officer. Intervisibility, or LOS, is always a concern for many reasons, including locating concealment opportunities. Certain communications intervisibility issues were raised with the signal officer, such as the feasibility of placing signal-relay nodes and the quality of communications they would afford at locations.

Involving the signal officer in the planning process allowed leaders to achieve a balance between minimizing the OPFOR's ability to receive the Blue

Force's (BLUFOR's) signal information and maximizing the BLUFOR's ability to hear one another and eavesdrop on the OPFOR. Considering LOS only, in selecting the optimum placement of signal-generation sources (tactical operation centers and relay nodes), could have created significant battlefield signatures and allowed the OPFOR to monitor information easily.

Based on their Focused Dispatch AWE hands-on experiences, the commander and staff members recommended that units receive a digital COA-development and rehearsal tool with display capabilities. The recommendations helped unit commanders and staffs better synchronize battlefield operations through the "understanding of the mission, commander's intent and factors influencing the battle."[14] This tool proved valuable during the exercise because it facilitated command and staff interactions and mutual understanding. Also, experiencing the LOS effects on communications contributed to the perceived value of this tool.

Dispersed operations and communications destruction, jamming and deception by the OPFOR were excluded from the exercise because of experiment requirements and the digital systems' developmental status. These factors could have made communications degradation more challenging. Warfighters and signal soldiers would have dealt systematically and interactively with these factors if they had been played. For example, they might have developed contingency plans to cover electronic-asset destruction, adjusted radio signal power levels or used the frequency-hopping mode.

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The Focused Dispatch AWE staff members were highly interactive overall and frequently included the signal officer in discussions. As a result, some communication problems were avoided—but not all because of considerable equipment limitations during the exercise. Such limitations should not be a normal part of the future digitized battlefield. Nonetheless, other factors, such as terrain characteristics and a real enemy, certainly will.

As battlefield digitization becomes a reality—and digitization is recognized as a valuable and vulnerable combat multiplier—then a sea change in conditions will become a reality. The real issue is exactly how the Army will deal with the digitization transformation and what changes it will make to staff decision-making processes, education and training.

NOTES

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